The claims remaining in the application are 1-3, 5-10, 12-15, 17-20 and 22-23.

REMARKS

The Applicant would like to thank the Examiner for the courteous and *very* quick Office Action. The Applicant particularly appreciates the indication that claims 3 and 10 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The Applicant also appreciates the withdrawal of rejections based on Lai, et al. and Hall, et al.

Claim Rejections Under 35 U.S.C. §112, First Paragraph

The Examiner rejected claim 2 under 35 U.S.C. §112, first paragraph, because the specification, while enabling for methods of adding aminocarboxylic acids and their salts to a guar or derivatized guar in an effective amount to directly break down the gel, allegedly does not reasonably provide enablement for the aminocarboxylic acid to act directly on the polymer and not on any cross-linking ion, if present. The Examiner contends that the specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to use the invention commensurate in scope with these claims. The Examiner alleges that claim 2 is not enabled since the EDTA would be expected to be present in an equilibrium system rather than as claim 2 sets forth. The Examiner asserts that this is supported in U.S. Pat. No. 5,981,447 to Chang, et al. at col. 12, lines 27-64. The Examiner contends that the aminocarboxylic acid would act only on the guar or derivatized guar and not any crosslinking ion when present, since the aminocarboxylic acid would be expected to be in equilibrium with all available cation ion species in the system to some extent. The Examiner alleges that it is known in the art that polyvalent ions crosslink many gel forming materials made up of hydratable polymers. The Examiner contends that the Applicant has not adequately enabled a system where the limitations of claim 2 exist when a cross-linking ion is present.

The Applicant would respectfully traverse.

Without admitting or agreeing to any of the Examiner's assertions, allegations or contentions, the Examiner's attention is respectfully directed to the amendments to claim 2 herein where the claim now recites "the aminocarboxylic acid acts directly and predominantly on the polymer rather than substantially on any crosslinking ion, if present". A corresponding amendment has been made to claim 9. It is respectfully submitted that these changes do not constitute improper insertion of new matter since this language is supported in the application as filed on page 11, lines 23-26 (Example 6), and on page 12, lines 7-10 (Example 7). It is thus respectfully submitted that since the language of claim 2 has been changed to be nearly exactly that of two of the Examples of the specification that the specification now enables any person skilled in the art to which it pertains, or with which it is most nearly connected, to use the invention commensurate in scope with these claims. This language also describes the invention more precisely. Reconsideration is respectfully requested.

Claim Rejections Under 35 U.S.C. §112, Second Paragraph

The Examiner rejected claim 2 under 35 U.S.C. §112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter that the Applicant regards as the invention. The Examiner contends that claim 2 is indefinite since the EDTA would be expected to be present in an equilibrium system rather than as claim 2 sets forth. Again, the Examiner contends that this position is supported in Chang, et al., at col. 12, lines 27-64. The Examiner alleges that it is unclear how the aminocarboxylic acid would act only on the guar or derivatized guar and not any crosslinking ion since the aminocarboxylic acid would be expected to be in equilibrium with all available ion species in the system to some extent. The Examiner further contends that it is known in the art that polyvalent ions cross-link gel forming materials made up of hydratable polymers.

The Applicant would respectfully traverse.

Without admitting or agreeing to any of the Examiner's assertions, allegations or contentions, the Examiner's attention is again respectfully directed to the amendments to claim 2 herein where the claim now recites "the aminocarboxylic acid acts directly and

predominantly on the polymer rather than substantially on any crosslinking ion, if present". A corresponding amendment has been made to claim 9. It is again respectfully submitted that these changes do not constitute improper insertion of new matter since this language is supported in the application as filed on page 11, lines 23-26 (Example 6), and on page 12, lines 7-10 (Example 7). It is thus respectfully submitted that since the language of claim 2 has been changed to be nearly exactly that of two of the Examples of the specification that the claims are now clear, definite and particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Of the two mechanisms or techniques or methods claimed, *i.e.* breaking the viscosity by acting directly on the polymer and breaking the viscosity by acting on the crosslinking ion, the former, acting directly on the polymer, predominates in the plain meaning of that term, *e.g.* dominating influence, prevailing, preponderant. Reconsideration is respectfully requested.

35 U.S.C. §102 Rejection Based on Dawson, et al.

The Examiner has rejected claims 1, 5-7, 9, 12, 14-15, 17-18 and 20-22 under 35 U.S.C. 102(b), as being allegedly anticipated by U.S. Pat. No. 5,624,886 to Dawson, et al.

The Examiner finds that Dawson, et al. (Examples) discloses the formation of gels employing hydroxypropyl guar and employs a breaker composition employing EDTA salts among other ingredients and crosslinks the composition with zirconium lactate. The Examiner notes that zirconium lactate is not a borate crosslinker. The claims do not exclude the further ingredients in the gel breaker.

The Applicant must respectfully traverse.

It is respectfully submitted that a patent claim is anticipated, and therefore invalid, only when a single prior art reference discloses each and every limitation of the claim. *Glaxo Inc. v. Novopharm Ltd.*, 52 F.3d 1043, 1047, 34 U.S.P.Q.2d 1565 (Fed. Cir.), cert. denied, 116 S.Ct. 516 (1995). As will be explained, Dawson, et al. do not disclose each and every limitation of the rejected claims, as amended.

The invention herein concerns the discovery that aqueous fluids comprising a guar or derivatized guar polymer gel can have that gel broken using one aminocarboxylic acid (or a salt thereof) because the acid acts *directly* on the polymer to break down the gel, as contrasted with attacking, removing or otherwise affecting the crosslinker – if one is present. The inventive method and fluids work whether or not the polymer gel is crosslinked. Thus, it has been demonstrated that it is the polymer *per se* that is acted on to break down the gel – not simply or only the removal of any crosslinking ion present. The Examiner's attention is respectfully directed to the fact that claims 1, 14 and 20 herein have been amended to recite that the aminocarboxylic acid (or a salt thereof) *acts directly on the polymer* to break down the gel. Support for this language is found on page 3, lines 25-26; page 4, line 2; and page 8, lines 11-12 and elsewhere of the application as originally filed and thus these amendments do not constitute improper insertion of new matter. As discussed above, claim 9 has been amended to recite that the aminocarboxylic acid acts directly and predominantly on the polymer rather than substantially on any crosslinking ion present to break down the gel.

It is respectfully submitted that Dawson, et al. only teach the use of EDTA salts as a chelants for the metal ion used for catalyzing the oxidizer that performs the breaking of the polymer. Dawson, et al. in the Abstract states of his composition: "The pellet so formed can also contain a chelating agent and an activator in order to enhance the rate of breaking." It is respectfully submitted that the Applicant's novel use of an aminocarboxylic acid does not fall into this class of use by Dawson, et al. Indeed, it is respectfully submitted that Dawson, et al. is inappropriately cited against the claims at issue because the reference exclusively teaches the degradation of polysaccharides by catalyzed oxidation, a mechanism or technique not claimed or desired by the Applicant. Rather "[t]he gel breaking method of this invention is expected to be an attractive alternative to using enzyme technology or catalyzed oxidizer technology", page 4, lines 4-5. Again please note the Abstract of Dawson, et al.: "The breaker is comprised of a substantially insoluble *oxidant* which is granulated and formed into a pellet or prill with a suitable binder." and column 5, lines 14-17: "The fracturing fluids of the invention also have incorporated therein a novel breaker which utilizes a substantially insoluble *oxidant* instead of a coated soluble oxidant, e.g., a persulfate." (Emphasis added.) In particular, please see

column 6, lines 22-30 for a description of how EDTA chelates the activators. Dawson, et al. teach nothing about EDTA degrading polysaccharides at all, either directly or indirectly.

The single reference therefore does not disclose (or suggest) each and every limitation of the claims, as amended. It is thus respectfully submitted that for these reasons, the instant rejection is overcome and rendered moot. Reconsideration is respectfully requested.

35 U.S.C. §102 Rejection Based on Smith, et al.

The Examiner has rejected claims 1, 5-9, 12-15, 17-20 and 22-23 under 35 U.S.C. 102(b), as being allegedly anticipated by U.S. Pat. No. 5,224,546 to Smith, et al.

The Examiner finds that Smith, et al. disclose guar gels cross-linked with titanium complex and employing as a gel breaker EDTA in concentrations of about 1, 2, 3 or 4 pptg (Example 2). The Examiner finds that Table 2 denotes the use of a 20% EDTA active set forth as gal. The estimated weight of a gal is about 12.15 lb. At 20% active this equates to about 2.43. The use of 0.4 gal of 20% EDTA active/1000 gal fluid is about 1 lb EDTA/1000 gal fluid. The use of 0.8 gal of 20% EDTA ctive/1000 gal fluid is about 2 lb EDTA/1000 gal fluid. The Examiner finds gels cross-linked with titanium complex are absent a borate cross-linker.

The Applicant must respectfully traverse.

It is again respectfully submitted that a patent claim is anticipated, and therefore invalid, only when a single prior art reference discloses each and every limitation of the claim. *Glaxo Inc. v. Novopharm Ltd., id.* As will be established, Smith, et al. also do not disclose each and every limitation of the rejected claims.

As noted above, claims 1, 14 and 20 herein have been amended to recite that the aminocarboxylic acid (or a salt thereof) *acts directly on the polymer* to break down the gel. Further, claim 9 has been amended to recite that the aminocarboxylic acid acts directly and predominantly on the polymer rather than substantially on any crosslinking ion present to break down the gel. The Examiner kindly indicated that claims 3 and 10 are objected to as being dependent upon a rejected base claim, but would be allowable if

rewritten in independent form. The Examiner's reason for the indication of allowable subject matter is "the prior art does not disclose or fairly suggest methods for breaking an aqueous guar or derivatized guar gel by adding an effective amount of aminocarboxylic acid or salt thereof to directly break down the gel." The Applicant respectfully submits that, with the amendments to the independent claims herein, that this same reason now also applies to all of the independent claims (as well as claims dependent thereon) and that all claims as amended are now allowable. Reconsideration is respectfully requested.

With specific reference to Smith, et al., the reference does not teach or suggest the use of an aminocarboxylic acid or salt thereof to act directly on the polymer to break down the gel. Smith, et al. instead only teaches, "At elevated temperatures, the esterified *chelator* undergoes hydrolysis to form an acid and *an active ligand which subsequently removes the crosslinking metal ion from the gel and hydrolyses the polymer.*" (Abstract, emphasis added.) Particularly instructive is the paragraph of Smith, et al., at column 5, lines 1-13:

> In the ester form, a carboxylic acid molecule is rendered relatively inactive as a chelator. However, at elevated temperatures or various pH values, the ester undergoes hydrolysis to form a free, active ligand or chelator. It is believed that the method and fluid of the present invention utilizes both the acid production from hydrolysis and the liberation of an active and highly effective chelator for metal ions to achieve improved degradation of the treating fluid. *The produced acid lowers the viscosity of the polymer chain of natural polymers, while the active chelator removes the metal ion which crosslinks the polymer chains, i.e., the chelator uncrosslinks the polymer.* (Emphasis added.)

Thus, in this paragraph, Smith, et al. explicitly teach that the esterified chelator undergoes hydrolysis to form two products, an acid and a free, active ligand or chelator. Smith, et al. teach that it is only the acid that lowers the viscosity of the polymer chain *per se*, and the active chelator only removes the metal ion that crosslinks the polymer chains, *i.e.* uncrosslinks the polymer. Thus, Smith, et al. do not teach the required limitation of the claim that at least one aminocarboxylic acid (or salt thereof) acts directly on the polymer to break down the gel. Instead, Smith, et al. *teach away from* the claimed invention by explicitly stating that the chelator only removes the metal ion, and it is the acid, not the chelator, that lowers the viscosity of the polymer chain itself.

Because the Examiner has not shown that the single reference has disclosed each and every limitation of the claims, the subject rejection under 35 U.S.C. §102 cannot stand. Reconsideration is respectfully requested.

35 U.S.C. §103 Rejection Based on Chang, et al.

The Examiner has rejected claims 1-2, 5-9, 12-15, 17-20 and 22-23 under 35 U.S.C. 103(a), as being allegedly unpatentable over U.S. Pat. No. 5,981,447 to Chang, et al. for reasons of obviousness. The Examiner finds that Chang, et al. (Ex. 1 and col. 18, lines 60 et seq.) disclose the addition of 0 to 100 lbm/1000 gal (pptg) in a HEC (hydroxy-ethylcellulose) gel forming and breaking system.

The Examiner admits that Chang, et al. differs from the claims in the use of HCE rather than guar gum.

The Examiner also finds that Chang, et al. disclose a number of guar and guar derivatized guar as suitable hydratable polymers useful in the disclosed systems (col. 14, lines 13, et seq.)

The Examiner contends that it would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to employ guar and/or derivatized guar as a hydratable polymer for forming the gels of Chang, et al. as an obvious functional equivalent of the HEC polymers exemplified for the art known gel forming function taught in the Chang, et al. reference.

The Applicant must respectfully traverse.

It is respectfully submitted that Chang, et al. is at least no more relevant to the claimed invention than is Dawson, et al., which is to say not at all. The only breaking mechanism taught or suggested in both of these references use catalyzed oxidizer breakers. It is respectfully submitted that there is no teaching or suggestion of using aminocarboxylic acids (or salts thereof) to act directly on the polymer to break down the gel.

Chang, et al.'s invention is described in their Abstract: "The chemical system contains a linear HEC polymer solution, a low solubility compound which slowly raises the fluid pH [*i.e.* MgO], a chelating agent [*i.e.* sodium EDTA] which further increases the pH level beyond the equilibrium achievable by the low solubility compound [*i.e.*

complexing out the Mg^{+2} ions], a metal crosslinker [*e.g.* zirconium lactate] which crosslinks HEC at elevated pH, a crosslink delay agent [*e.g.* sodium lactate] which allows fluid viscosity to remain low until the fluid reaches the subterranean formation, and optionally an internal breaker [*e.g.* in-solution or encapsulated oxidizers, which can be catalyzed]".

Column 9, line 58 to column 10, line 15 of Chang, et al. and Table D therein further describe the breakers suitable for their invention:

> Depending on the reservoir temperature, different types of breakers may be used to reduce the fluid viscosity and to enhance flowback during oil and gas production. Breaker systems and concentrations are designed to reduce the crosslinked fluid viscosity to nearly water viscosity after about 24 hours. If desired, the internal breaker may be omitted, and an inorganic acid (e.g., hydrochloric acid) or organic acid (e.g., formic acid, acetic acid and citric acid) soak used an external breaking mechanism.
>
> Different breakers may be used for different temperature applications. Further, long break times may require using encapsulated breakers in aggressive concentrations at temperatures below 175°F. At 200°F., a catalyst preferably used to activate bromate breakers effectively, if used. For example, at temperatures ranging from about 80°F. to about 125°F. (27°C. to 52°C.), *ammonium persulfate* is preferred as the internal breaker system. At temperatures ranging from about 125°F. to about 175°F. (52°C. to 79°C.), an encapsulated *ammonium persulfate* is preferred as the internal breaker. At temperatures ranging from about 175°F. to about 225°F. (79°C. to 107°C.), the preferred internal breaker is *sodium bromate* used in conjunction with a breaker aid such as copper chloride and ferrous sulfate. Breaker aids lower the activation energy of the breaker, e.g., *sodium bromate*, in order to effectively operate in this temperature range. At temperatures ranging from about 225°F. to about 250°F. (107°C. to 121°C.), an encapsulated *sodium bromate* is preferred as the internal breaker. *Above 250°F. (121°C.), an internal breaker is not preferred.* The encapsulating coating for the encapsulated *ammonium persulfate* and the encapsulated sodium bromate is preferably a vinylidene chloride/methylacrylate copolymer with an optional coating of talc (magnesium silicate hydrate). The copolymer coating ranges from about 10 to about 30% by weight of the total breaker weight. (Emphasis added.)

It is respectfully noted that only oxidizer breakers are taught by Chang, et al. In particular, this passage of Chang, et al. is consistent with paragraph **[0005]** of the subject specifications that discusses that persulfate oxidizers and bromate oxidizers are effective over only limited temperature ranges (although the temperature range limits are different than those given in Chang, et al.):

> **[0005]** Many viscosity-breaking technologies are most effective only over limited temperature ranges. For instance, persulfate oxidizers are generally too reactive to be properly used above about 140°F (60°C) and bromate oxidizers do not work until about 220°F (104°C) and above. Enzyme technology generally works between about 150 to 220°F (66 to 104°C).

Thus, in no place do Chang, et al. mention, state or propose that sodium EDTA is a breaker for their pill fluid. Only conventional oxidizer breakers are mentioned and specified. There is nothing in Chang, et al. to teach or render obvious the use of EDTA as a breaker to act directly on the polymer to break down the gel. To the contrary and just the opposite, the EDTA is termed by Chang, et al. as a "crosslink enhance agent" (column 19, line 13 and column 25, lines 37-38). Chang, et al. show usage of very high amounts of sodium EDTA (up to 100 pptg) to complex magnesium ions (column 21, lies 41-42), so that an increase in pH can occur which will allow more zirconium crosslinker to be made available into the free form from the lactate form (column 21, lines 35-49). While this may be a novel use of sodium EDTA, it is <u>not</u> the Applicant's method.

> To increase the crosslink time, it was discovered that adding 60% active sodium lactate solution resulted in a prolonged crosslink delay. The mechanism by which this delay occurs is unclear, but one possible explanation is as follows. In this embodiment, the crosslinker contains zirconium lactate. The addition of excess lactate ions to the system released from sodium lactate are believed to suppress the release of zirconium ions (Zr^{4+}) from the crosslinker and decrease the concentration of zirconium ions in the system available for crosslinking the HEC. *However, as $EDTA^{4-}$ ions chelate the Mg^{2+} ions present in the activator, there is an increase in the release of hydroxyl ions (OH^-). As the pH of the system increases, crosslinking occurs more rapidly and the concentration of free zirconium ions in the system is further reduced. This eventually overrides the effect of the sodium lactate and causes the crosslinker to release more zirconium ions. As more zirconium ions are released, more crosslink bonds and a stronger crosslinked gel are formed.* (Column 21, lines 31-49, emphasis added.)

In short, Chang, et al. teaches that the use of EDTA chelants as an agent to <u>enhance</u> crosslinking and <u>make a stronger gel</u>, not to act directly on the polymer to break down the gel. In other words, Chang, et al. *teaches directly away* from the invention. The Examiner's attention is again respectfully directed to *In re Haruna, et al.*, 249 F.3d 1327, 1335; 58 U.S.P.Q. 2d 1517 (Fed. Cir. 2001):

> "A prima facie case of obviousness can be rebutted if the applicant ... can show 'that the art in any material respect taught away' from the claimed invention." *In re Geisler*, 116 F.3d 1465, 1469, 43 U.S.P.Q.2d (BNA) 1362, 1365 (Fed. Cir. 1997) (quoting *In re Malagari*, 499 F.2d 1297, 1303, 182 U.S.P.Q. (BNA) 549, 533 (CCPA 1974)). "A reference may be said to teach away when a person of ordinary skill, upon reading the reference, ... would be led in a direction divergent from the path that was taken by the applicant." *Tec Air, Inc. v. Denso Mfg. Mich. Inc.*, 192 F.3d 1353, 1360, 52 U.S.P.Q.2d (BNA) 1294, 1298 (Fed. Cir. 1999).

It is respectfully submitted that one having ordinary skill in the art at the time of the invention would not know that an aminocarboxylic acid (or salt thereof) could act directly on the polymer to break down the guar or derivatized guar polymer gel of the invention in the face of the Chang, et al. art discussed above teaching away from the invention. It is thus respectfully submitted that a *prima facie* obviousness rejection has not been established with respect to any of the rejected claims over the reference. Reconsideration is respectfully requested.

It is respectfully submitted that the arguments and amendments presented above overcome all of the instant rejections. Reconsideration and allowance of the claims are respectfully requested. The Examiner is respectfully reminded of his duty to indicate allowable subject matter. The Examiner is invited to call the Applicant's attorney at the number below for any reason, especially any reason that may help advance the prosecution.

Respectfully submitted,
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